UNIVERSITY OF SASKATCHEWAN
COLLEGE OF ENGINEERING

GENERAL ENGINEERING (G.E.) 110

ALL SECTIONS
FINAL EXAMINATION

OPEN TEXT BOOK EXAM **CALCULATORS ARE ALLOWED**

NOTES MAY BE WRITTEN IN THE TEXT, HOWEVER, NO LOOSE PAPERS ARE ALLOWED

TIME: 3 HOURS **DECEMBER 13, 2005**

Candidates are to answer all questions.
You are to show your solution in the space below the question.
The reverse side of the page may be used if required.
State all necessary assumptions.

NEATNESS and CLARITY will be considered in the marking of this examination

Name: _____
(First Name) (Last Name)

Name of Lecturing Professor: _____

Student Number: _____

Examination Room: _____

Marks

1._____
2._____
3._____
4._____
5._____
6._____
7._____
8._____
_____

Notes: **All questions have equal marks (10 x 8 = 80)**

Make sure you have 8 problems in the exam

Please write your name at the bottom of each sheet and your Professor's name.

Question #1

The metal alloy brass is formed by combining copper(Cu) and zinc(Zn) in various proportions. A 70-30 brass contains 70% Cu and 30% Zn. If a foundry has melted 150 kg of 70 – 30 brass, how much zinc should be added to form 60 – 40 brass which contains 60% Cu and 40% Zn?

Question #2

The steepness of a railroad track over a 3-mi grade is reported as a rising grade of 1 in 43, meaning that it rises 1 ft for every 43 ft in track. Following the rise, the track now descends 5 mi with a descending grade of 1 in 79.

a) Is the elevation at the end of the 5-mi descent less than, greater than, or equal to the elevation at the start of 3-mi ascent?

b) If a contour map of the area, with a horizontal scale of 1:12,000, has contour intervals of 25 ft, what is the horizontal distance between contour lines on the map for the down grade portion of the track?

Question #3

a) Sketch the sectional view as indicated by the cutting plane line in Figure I .

b) Sketch the isometric view of the unsectioned (whole) object.

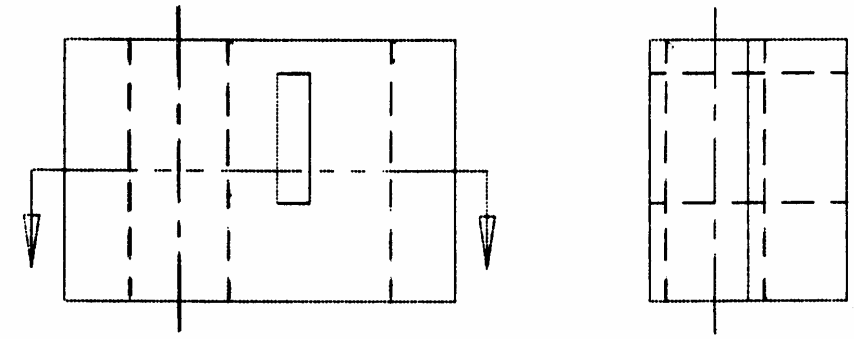

Figure I

Question #4

a) Sketch the missing orthographic view in the Figure II.

b) Sketch the isometric view.

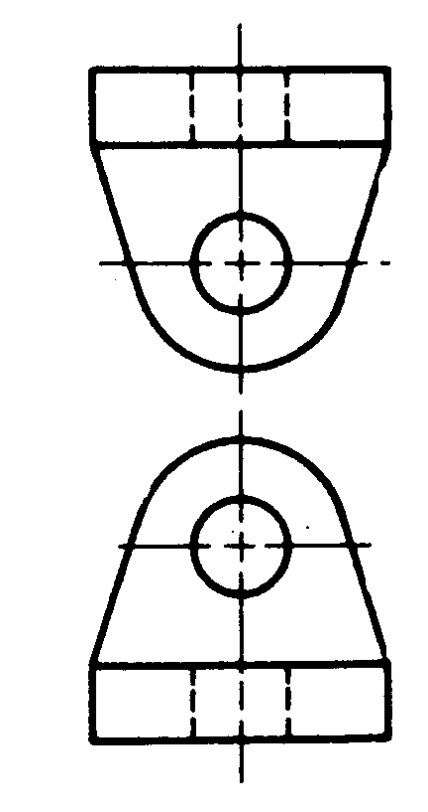

Figure II

Question #5

Three circles of radius R are drawn such that each touches the other two. A fourth circle of radius r, is drawn so that it passes through the points of contact of the larger circles. Determine the ratio of the radii of the two circles.

Question #6

A dynamic force laboratory experiment was used to determine the relationship between force (F) measured in Newtons and time (t) in seconds. The data show that there is a linear relationship between $\log_{10} F$ versus t. The slope of the line when plotted on linear paper is 0.05. One of the raw data points is (t = 2 sec; F = 34 N).

a) Determine the equation that expresses the relationship between force and time in exponential form (i.e. to the base e).

b) State units of the constants in the equation.

Question #7

At a recent world cup 10,000 m race, the winner, A, finished in 13 minutes 20.4 seconds. The last runner in the race, B, took 15 minutes 37.0 seconds. The track is 400 m long.

i) How many metres did B still have to run when A finished?
ii) How far had A run when he first lapped B?
iii) How many times was B lapped (overtaken)?

Question #8

On December 13, 2005 air traffic controllers in a control tower in central Ulanbangor have been tracking an unidentified aircraft (UAC) on their radar screen for the past 10 minutes. The UAC has entered Ulanbangor's eastern border and is flying through its air space west north west (bearing 290 degrees east of north) at an altitude of 35,000 ft and travelling at 560 km / hr. This aircraft will not respond to the operators of the control tower and so they receive permission to intercept the UAC to try to determine its identity and purpose and to shoot it down if necessary. They call on a fighter jet that can travel twice the speed of the UAC. Twenty minutes later, after the first sighting of the UAC, at precisely 23:00 hrs (Ulanbangor Standard Time(UST)) the fighter jet gets into position directly over the tower at an altitude of 35,000 ft. At that moment the UAC is 200 km north and 52 km east of the tower.

i) What direct bearing (east of north) should the fighter jet take to intercept the UAC?
ii) What will be the coordinates of the point of interception relative to the tower?
iii) What will be the time of the interception?